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Claims

We claim:

- 5 1. A sideframe pedestal to axle bearing interface assembly for a three piece rail road car truck, said interface assembly having fittings operable to rock both laterally and longitudinally.
2. The sideframe pedestal to axle bearing interface assembly of claim 1 wherein said assembly includes mating surfaces of compound curvature, the compound curvature including curvature in both lateral and horizontal directions.
- 10 3. The sideframe pedestal to axle bearing interface assembly of claim 1 wherein said assembly includes at least one rocker element and a mating element, the rocker and mating element being in point contact with a mating element, said element in point contact being movable in rolling point contact with said mating element.
4. The sideframe pedestal to axle bearing interface assembly of claim 3 wherein said element in point contact is movable in rolling point contact with said mating element both laterally and  
15 longitudinally.
5. The sideframe pedestal to axle bearing interface assembly of claim 1 wherein said fittings include rockingly matable saddle surfaces.
6. The sideframe pedestal to axle bearing interface assembly of claim 1 wherein said fittings include a  
20 male surface having a first compound curvature and a mating female surface having a second compound curvature in rocking engagement with each other, and one of said surfaces includes at least a spherical portion.
7. The sideframe pedestal to axle bearing interface assembly of claim 1 wherein, relative to a vertical axis of rotation, rocking motion of said fittings longitudinally is torsionally de-coupled from rocking of said fittings laterally.
- 25 8. The sideframe pedestal to axle bearing interface assembly of claim 1 wherein said fittings include a force transfer interface that is torsionally compliant relative to torsional moments about a vertical axis.
9. The sideframe pedestal to axle bearing interface assembly of claim 1 wherein said assembly includes an elastomeric member.
- 30 10. A swing motion three piece rail road car truck having a laterally extending truck bolster, a pair of longitudinally extending sideframes to which the truck bolster is resiliently mounted, and wheelsets to which the side frames are mounted, damper groups mounted between the bolster and each of the sideframes, the damper groups each having a four-cornered damper layout, and wheelset to sideframe pedestal interface assemblies operable to permit lateral swinging motion of the  
35 sideframes and longitudinal self-steering of the wheelsets.
11. A three piece rail road car truck having a truck bolster mounted between sideframes, and wheelsets to which the sideframes are mounted, and wheelset to sideframe interface assemblies by which to mount said sideframes to said wheelsets, said sideframe to wheelset interface assemblies including rocking apparatus to permit said sideframes to swing laterally, said rocking apparatus including first

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and second surfaces in rocking engagement, at least a portion of said first surface having a first radius of curvature of less than 30 inches, and said sideframe to wheelset interface including self steering apparatus.

- 5 12. The three piece rail road car truck of claim 11 wherein said self steering apparatus has a force-deflection characteristic that varies with vertical loading of said sideframe to wheelset interface assembly.
13. A three piece rail road freight car truck having self steering apparatus, wherein said self steering apparatus includes at least one longitudinal rocker.
- 10 14. A three piece rail road freight car truck having passive self steering apparatus, said self steering apparatus having a linear force-deflection characteristic, and said force-deflection characteristic varying as a function of vertical loading of said truck.
- 15 15. The three piece rail road freight car truck of claim 14 wherein said force-displacement characteristic varies linearly with vertical loading of said truck.
16. The three piece rail road freight car truck of claim 14 wherein said self steering apparatus includes a rocker mechanism.
- 20 17. A three piece rail road freight car truck having a transversely extending truck bolster, a pair of side frames mounted at opposite ends of said truck bolster, and resiliently connected thereto, and wheelsets, said sideframes being mounted to said wheelsets at sideframe to wheelset interface assemblies, at least one of said sideframe to wheelset interface assemblies being mounted between a first end of an axle of one of said wheelsets, and a first pedestal of a first of said sideframes, said wheelset to sideframe interface assembly including a first line contact rocker apparatus operable to permit lateral swinging of said first sideframe and a second line contact rocker apparatus operable to permit longitudinal displacement of said first end of said axle relative to said first sideframe.
- 25 18. The three piece rail road freight car truck of claim 17 wherein said first and second rocker apparatus are mounted in series with a torsionally compliant member, said torsionally compliant member being compliant to torsional moments applied about a vertical axis.
19. The three piece rail road freight car truck of claim 18 wherein a torsionally compliant member is mounted between said first and second rocker apparatus, said torsionally compliant member being torsionally compliant about a vertical axis.
- 30 20. A three piece railroad car truck having a laterally extending truck bolster, said truck bolster having first and second ends; first and second longitudinally extending sideframes resiliently mounted at said first and second ends of said bolster respectively; and said side frames being mounted on wheelsets at sideframe to wheelset mounting interface assemblies; a four cornered damper group being mounted between each end of said truck bolster and the respective side frame to which that end is mounted; and said sideframe to wheelset mounting interface assemblies accommodating rotational deflection of the wheelsets relative to the sideframes about a predominantly vertical axis.
- 35 21. The three piece rail road car truck of claim 20 wherein said truck is free of unsprung lateral cross-members between said sideframes.
22. The three piece rail road car truck of claim 20 wherein said sideframes are mounted to swing

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laterally.

23. The three piece rail road car truck of claim 22 wherein said sideframe to wheelset mounting interface assemblies include self steering apparatus.
24. A three piece rail road car truck having a truck bolster mounted transversely between a pair of sideframes, said truck bolster having ends, each of said ends of said truck bolster being resiliently mounted to a respective one of said sideframes, said truck having a set of dampers mounted in a four cornered damper arrangement between each said bolster end and its respective sideframe, each damper having a bearing surface mounted to work slidingly against a mating surface at a friction interface in a substantially stick-slip free relationship when said bolster moves relative to said sideframes, each damper having a seat against which to mount a biasing device for urging the bearing face against the mating surface, said bearing face of said damper having a dynamic co-efficient of friction and a static co-efficient of friction when working against said mating surface.
25. The truck of claim 24 wherein said co-efficients of friction have respective magnitudes within 10 % of each other.
26. The truck of claim 24 wherein said co-efficients of friction are substantially equal.
27. The truck of claim 24 wherein said co-efficients of friction lie in the range of 0.1 to 0.4.
28. The truck of claim 24 wherein said co-efficients of friction lie in the range 0.2 to 0.35.
29. The truck of claim 24 wherein said truck is a self-steering truck.
30. The truck of claim 24 wherein said truck includes a bearing adapter to sideframe pedestal interface that includes a self-steering apparatus.
31. The truck of claim 24 wherein said truck has a bearing adapter to sideframe pedestal interface that includes a bi-directional rocker operable to permit lateral rocking of said sideframes and to permit self-steering of said truck.
32. A three piece railroad car truck having a bolster transversely mounted between a pair of sideframes, and wheelsets mounted thereto by wheelset to sideframe interface assemblies, said interface assemblies being operable to permit self steering, said assemblies having a self steering force-deflection characteristic that is a function of vertical load.
33. A bearing adapter for a railroad car truck, said bearing adapter having a body for seating upon a bearing of a rail road truck wheelset, and a rocker member for mounting to said body, said rocker member having a rocking surface, said rocking surface facing away from said body when said rocker member is mounted to said body, and said rocker being made of a different material from said body.
34. A three piece railroad car truck having a truck bolster mounted transversely to a pair of side frames, each of said sideframes having fore and aft pedestal seat interface fittings, and a pair of wheelsets mounted to said pedestal seat interface fittings, said pedestal seat interface fittings including rockers operable to permit said truck to self steer.
35. A railroad car truck having a truck bolster mounted transversely between a pair of sideframes, and wheelsets mounted to said sideframes to permit rolling operation of said truck along a set of rail road tracks, said truck including rocker elements mounted between said sideframes and said wheelsets, said

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rocker elements being operable to permit lateral swinging of the sideframes and to permit self-steering of said truck.

36. A railroad car truck having a pair of sideframes, a pair of wheelsets having ends for mounting to said sideframes, and sideframe to wheelset interface fittings, said sideframe to wheelset interface fittings including rocking members having a first degree of freedom permitting lateral swinging of said sideframes relative to said wheelsets, a second degree of freedom permitting longitudinal rocking of said wheelset ends relative to said sideframes.
37. A railroad car truck having rockers formed on a compound curvature, said rockers being operable to permit both a lateral swinging motion in said truck and self steering of said truck.
38. A railroad car truck having a pair of sideframes, a pair of wheelsets having ends for mounting to said sideframes, and sideframe to wheelset interface fittings, said sideframe to wheelset interface fittings including rocking members having a first degree of freedom permitting lateral swinging of said sideframes, a second degree of freedom permitting longitudinal rocking of said wheelset ends relative to said sideframes, and said wheelset to sideframe interface fittings being torsionally compliant about a predominantly vertical axis.
39. A swing motion rail road car truck having a transverse bolster sprung between a pair of side frames, and a pair of wheelsets mounted to said sideframes at wheelset to sideframe interface fittings, said wheelset to sideframe interface fittings including swing motion rockers and elastomeric members mounted in series with said swing motion rockers to permit said truck to self-steer.
40. A rail road car truck having a transverse bolster sprung between two sideframes, and wheelsets mounted to said sideframes at wheelset to sideframe interface fittings, said truck having a spring groups and dampers seated in said bolster and biased by said spring groups to ride against said sideframes, said spring groups including a first damper biasing spring upon which a first damper of said dampers seats, said first damper biasing spring having a coil diameter, and said first damper having a width of more than 150 % of said coil diameter.
41. A rail road car truck having a bolster having ends sprung from a pair of sideframes, and wheelsets mounted to said sideframes at wheelset to sideframe interface fittings, said wheelset to sideframe interface fittings including bi-directional rocker fittings for permitting lateral swinging of said sideframes and for permitting self steering of said wheelsets, and said truck having a four cornered arrangement of dampers mounted at each end of said bolster.
42. The rail road car truck of claim 41 wherein said interface fittings are torsionally compliant about a predominantly vertical axis.
43. A self-steering rail road car truck having a transversely mounted bolster sprung between two sideframes, and wheelsets mounted to said sideframes, said sideframes being mounted to swing laterally relative to said wheelsets; said truck having friction dampers mounted between said bolster and said sideframes, said friction dampers having co-efficients of static friction and dynamic friction, said co-efficients of static and dynamic friction being substantially the same.
44. A self-steering rail road car truck having a transversely mounted bolster sprung between two sideframes, and wheelsets mounted to said sideframes, said sideframes being mounted to swing

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laterally relative to said wheelsets, said truck having friction dampers mounted between said bolster and said sideframes, said friction dampers having a co-efficient of static friction,  $u_s$ , and a co-efficient of dynamic friction,  $u_k$ , and a ratio of  $u_s/u_k$  lies in the range of 1.0 to 1.1.

- 5 45. A self-steering rail road car truck having a transversely mounted bolster sprung between two sideframes, and wheelsets mounted to said sideframes, said sideframes being mounted to swing laterally relative to said wheelsets, said truck having friction dampers mounted between said bolster and said sideframes in a sliding friction relationship that is substantially free of stick-slip behaviour.
- 10 46. The self-steering rail road car truck of claim 45 wherein said bolster has bolster pockets formed therein for accommodating said dampers, said friction dampers include friction damper wedges having a first face for engaging one of said sideframes, and a second, sloped, face for engaging a bolster pocket, and said sloped face is mounted in said bolster pocket in a sliding friction relationship that is substantially free of stick-slip behaviour.
- 15 47. A self-steering rail road car truck having a bolster mounted between a pair of sideframes, and wheelsets mounted to said sideframes for rolling motion along railroad tracks, said wheelsets being mounted to said sideframes at wheelset to sideframe interface fittings operable to permit lateral rocking of said truck, said truck having a set of friction dampers mounted between said bolster and each of said sideframes, said friction dampers having a first face in sliding friction relationship with said sideframes and a second face seated in a bolster pocket of said bolster, said first face, when operated in engagement with said sideframe, having a co-efficient of static friction and a co-efficient of dynamic friction, said 20 co-efficients of static and dynamic friction of said first face differing by less than 10 %, and said second face, when mounted within said bolster pocket, has a co-efficient of static friction, and a co-efficient of dynamic friction, and said co-efficients of static and dynamic friction of said second face differing by less than 10 %.
- 25 48. The rail road car truck of claim 47 wherein said co-efficients of static and dynamic friction of said first face are substantially equal.
- 30 49. A self-steering rail road car truck having a bolster mounted between a pair of sideframes, and wheelsets mounted to said sideframes for rolling motion along railroad tracks, said wheelsets being mounted to said sideframes at wheelset to sideframe interface fittings operable to permit lateral rocking of said truck, said truck having a set of friction dampers mounted between said bolster and each of said sideframes, said friction dampers having a first face in slidable friction relationship with said sideframes and a second face seated in a bolster pocket of said bolster, said first face and said side frame being co-operable and being substantially in a stick-slip free condition, and said second face and said bolster pocket being in a substantially stick-slip free condition.
- 35 50. A rail road car truck bearing adapter rocker, said rocker having a rocking surface for rocking engagement with a mating surface of a pedestal seat of a sideframe of a railroad car truck, said rocking surface having a compound curvature to permit both lengthwise and sideways rocking.
51. A rail road car truck pedestal seat rocker, said rocker having a rocking surface for rocking engagement with a mating surface of a bearing adapter of a railroad car truck, said rocking surface having a compound curvature to permit both lengthwise and sideways rocking.

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52. A railroad freight car truck having wheelsets mounted in a pair of sideframes, said sideframes having pedestals for receiving said wheelsets, said pedestals having pedestal jaws, said jaws including sideframe pedestal jaw thrust blocks, said wheelsets having bearing adapters mounted thereto for installation between said jaws, said sideframe pedestals having respective pedestal seat members rockingly co-operable with said bearing adapter, and said truck having members mounted intermediate said jaws and said bearing adapters for urging said bearing adapter to a centered position relative to said pedestal seat.
53. A wheelset-to-sideframe interface assembly for a railroad car truck, said interface assembly comprising:
- 10 a bearing adapter and a mating pedestal seat;
- said bearing adapter having first and second ends formed for interlocking insertion between a pair of pedestal jaws of a railroad or sideframe;
- said bearing adapter having a first rocking member;
- said pedestal seat having a second rocking member;
- 15 said first and second rocking members being matingly engageable to permit lateral and longitudinal rocking therebetween;
- a resilient member mounted between said bearing adapter and said pedestal seat;
- said resilient member having a portion formed to engage said first end of said bearing adapter; and
- said resilient member having an accommodation formed therein to permit mating engagement of
- 20 said first and second rocking members.
54. The wheelset-to-sideframe interface assembly of claim 53 wherein said resilient member has first and second ends formed for interposition between said bearing adapter and pedestal jaws of the sideframe.
55. A wheelset-to-sideframe interface assembly for a rail road car truck, said interface assembly comprising:
- 25 a bearing adapter, a pedestal seat, and a resilient member;
- said bearing adapter having a first end and a second end, each of said first and second ends having an end wall bracketted by a pair of corner abutments, said end wall and corner abutments co-operating to define a channel permitting insertion of said
- 30 bearing adapter between a pair of thrust lugs of a sideframe pedestal;
- said bearing adapter having a first rocking member;
- said pedestal seat having a second rocking member for making engagement with said first rocking member;
- said first and second rocking members, when engaged, being operable to rock
- 35 longitudinally relative to a sideframe to permit the rail road car truck to steer;
- said resilient member having a first end portion engageable with said first end of said bearing adapter for interposition between said first end of said bearing adapter and a first pedestal jaw thrust lug;

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- said resilient member having a second end portion engageable with said second end of said bearing adapter for interposition between said second end of said bearing adapter and a second pedestal jaw thrust lug;
- said resilient member having a medial portion lying between said first and second end portions; and
- said medial portion being formed to accommodate mating rocking engagement of said first and second rocking members.
56. A resilient pad for use with a bearing adapter for a railroad car truck, the bearing adapter having a rocker member for mating, rocking engagement with a rocker member of a pedestal seat, said resilient pad having a first portion for engaging a first end of the bearing adapter, a second portion for engaging a second end of the bearing adapter, and a medial portion between said first and second end portions, said medial portion being formed to accommodate mating engagement of the rocker members.
57. A wheelset-to-sideframe interface assembly kit, said kit comprising:
- a pedestal seat for mounting in the roof of a rail road car truck sideframe pedestal;
- a bearing adapter for mounting to a bearing of a wheelset of a rail road car truck and a resilient member for mounting to said bearing adapter;
- said bearing adapter having a first rocker element for engaging said seat in rocking relationship;
- said bearing adapter having a first end and a second end, each of said ends having an endwall and a pair of abutments bracketing said end wall to define a channel, permitting sliding insertion of said bearing adapter between a pair of sideframe pedestal jaw thrust lugs;
- said resilient member having a first portion conforming to said first end of said bearing adapter for interpositioning between said bearing adapter and a thrust lug;
- said resilient member having a second portion connected to said first portion when installed, said second portion at least partially overlying said bearing adapter.
58. A bearing adapter for installation in a rail road car truck sideframe pedestal, said bearing adapter having an upper portion engageable with a pedestal seat, and a lower portion engageable with a bearing casing, said lower portion having an apex, said lower portion including a first land for engaging a first portion of the bearing casing, a second land for engaging a second portion of the bearing casing, said first land lying to one side of the apex, the second land lying to the other side of the apex, and at least one relief located between said first and second lands.
59. A kit for retro-fitting a railroad car truck having elastomeric members mounted over bearing adapters, said kit comprising a mating bearing adapter and a pedestal seat, said bearing adapter and said pedestal seat having co-operable bi-directional rocker elements, said seat having a depth of section of greater than 1/2 inches.

60. A railroad car truck having a bolster and a pair of co-operating sideframes mounted on wheelsets for rolling operation along railroad tracks, said truck having rockers mounted between said sideframes to permit lateral swinging of said sideframes, said truck being free of lateral unsprung cross-bracing between said sideframes, said sideframes having a lateral pendulum height,  $L$ , measured between a lower location at which gravity loads are passed into the sideframe, and an upper location at said rocker where a vertical reaction is passed into the sideframes, said rocker including a male element having a radius of curvature,  $r_1$ , and a ratio of  $r_1 : L$  is less than 3.
61. The railroad car truck of claim 60 wherein said rocker has a female element in mating engagement with said male element, said female element having a radius of curvature  $R_1$  greater than  $r_1$ , and the factor  $[(1/L) / ((1/r_1) - (1/R_1))]$  is less than 3.
62. The railroad car truck of claim 61 wherein  $R_1$  is at least  $4/3$  as large as  $r_1$ , and  $r_1$  is greater than 15 inches.
63. The railroad car truck of claim 62 wherein  $R_1$  is between 15 and 45 inches.
64. A sideframe pedestal to axle bearing interface assembly for a three piece rail road car truck, said interface assembly having fittings operable to rock both laterally and longitudinally, and said interface assembly including a bearing assembly having one of said rocking surface fittings defined integrally thereon.
65. The sideframe pedestal to axle bearing interface assembly of claim 64 wherein said assembly includes a resilient biasing member.
66. A sideframe pedestal to axle bearing interface assembly for a three piece rail road car truck, said interface assembly having mating rocking surfaces, said assembly including a bearing mounted to an end of a wheelset axle, said bearing having an outer ring, and one of said rocking surfaces is rigidly fixed relative to said bearing.
67. A bearing for mounting to one end of an axle of a wheelset of a three-piece railroad car truck, said bearing having an outer member mounted in a position to permit the end of the axle to rotate relative thereto, and said outer member has a rocking surface formed thereon for engaging a mating rolling contact surface of a pedestal seat member of a sideframe of the three piece truck.
68. The bearing of claim 67 wherein said bearing has an axis of rotation coincident with a centerline axis of the axle and said surface has a region of minimum radial distance from said center of rotation and a positive derivative  $dr/d\theta$  between said region and points angularly adjacent thereto on either side.
69. A combination of claim 67 and the pedestal seat, wherein said bearing has an axis of rotation, a first location on said surface of said bearing lies radially closer to said axis of rotation than any other location thereon; a first distance,  $L$  is defined between said axis of rotation and said first location, said surface of said bearing and said surface of said pedestal seat each have a radius of curvature and mate in a male and female relationship, one radius of curvature being a male radius of curvature  $r_1$ , the other radius of curvature being a female radius of curvature,  $R_2$ ;  $r_1$  being greater than  $L$ ,  $R_2$  is greater than  $r_1$ , and  $L$ ,  $r_1$  and  $R_2$  conform to the formula  $L^{-1} - (r_1^{-1} - R_2^{-1}) > 0$ .
70. The combination of claim 69 wherein said rocking surfaces are co-operable to permit self steering.